A Network of Technology and Quality

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"Enabling Sustainable Space Exploration"

ASSESSMENT OF LEAD-FREE SOLDER ENVIRONMENTAL BENEFITS WHEN USED IN ELECTRICAL AND ELECTRONIC EQUIPMENT

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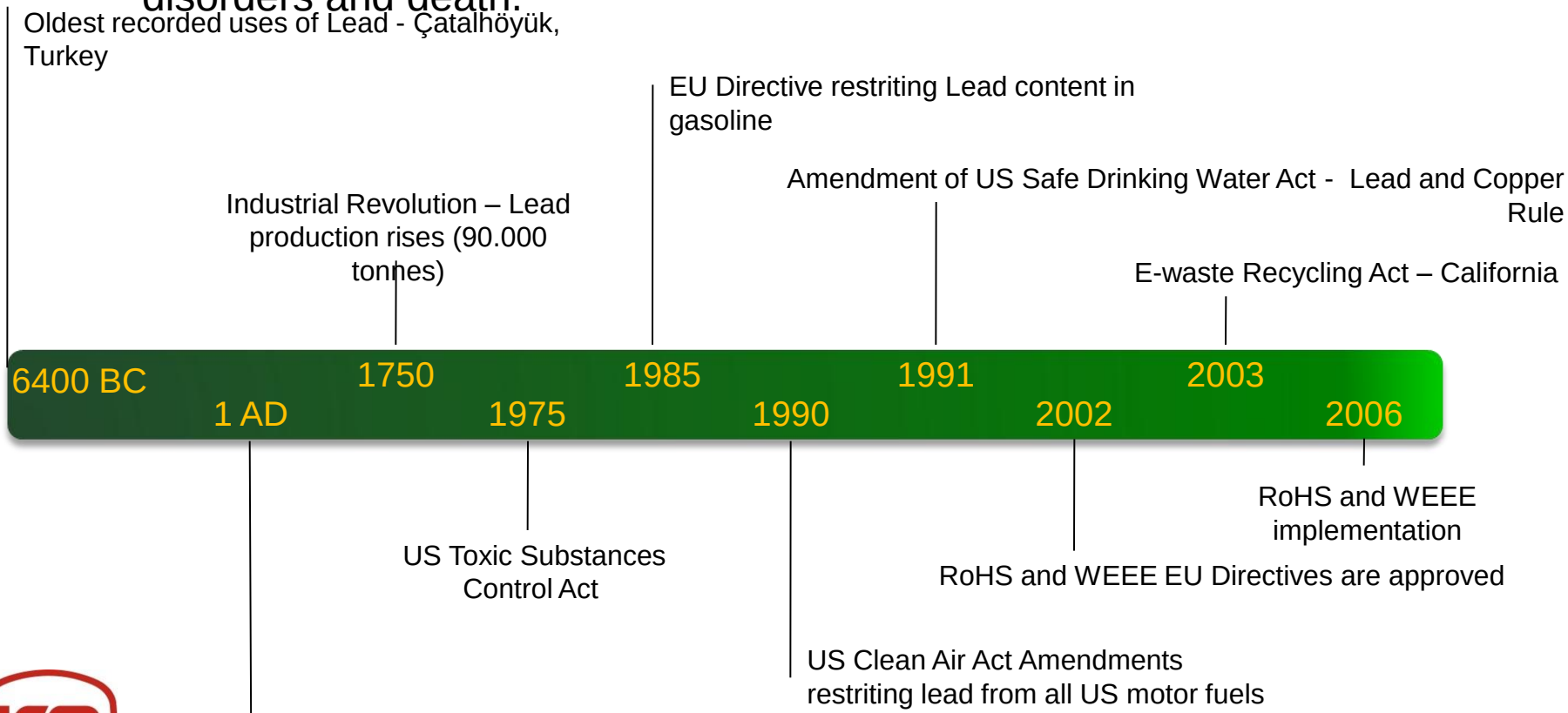
Contents

- Background
- Lead on EEE
- Solders Life Cycle Assessment
- Components Life Cycle Assessment
- Conclusions

Background

Lead is a highly toxic metal that may cause a range of health effects, from behavioural problems and learning disabilities, to seizures, damaged nervous connections (especially in young children), blood and brain disorders and death.



Where is Lead on EEE?

LEADOUT

Solders

ELECTROVALUE

Components

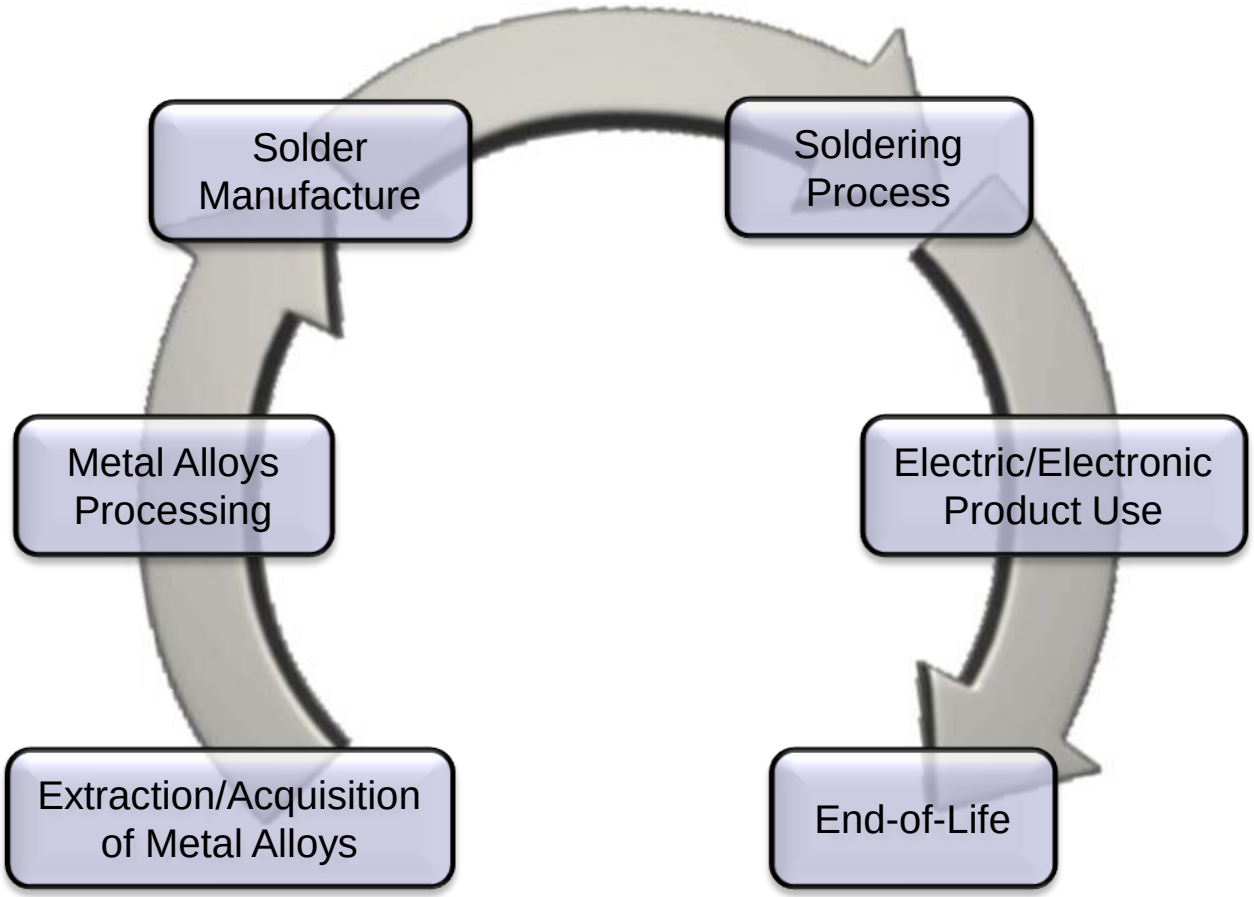
Life Cycle Assessment

What is the Life Cycle Assessment?

Compilation and evaluation of the inputs, outputs and the potential environmental impacts of the consecutive and interlinked stages of a product system, from raw material acquisition or generation of natural resources to final disposal.

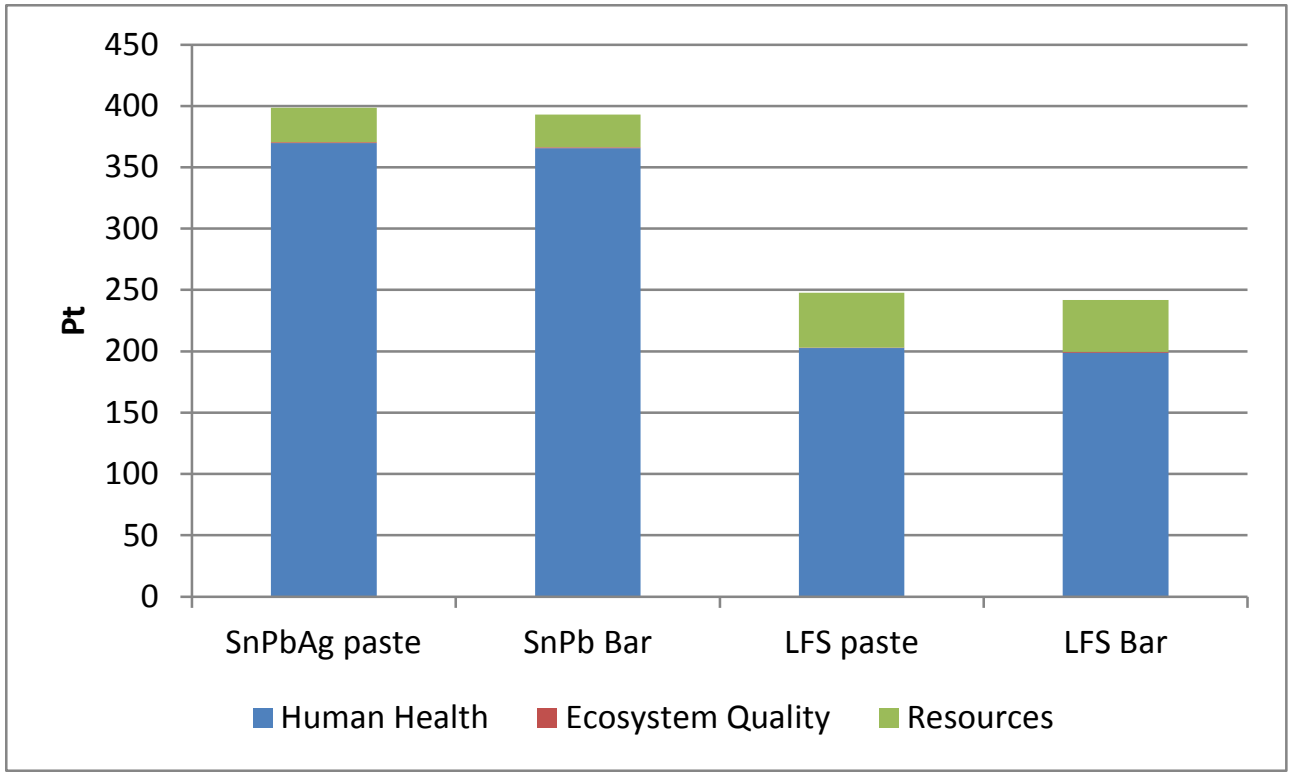
ISO 14040: Environmental management - Life cycle assessment – Principles and framework, International Organisation for Standardisation (ISO), Geneve 2006

Solders Life Cycle



Results

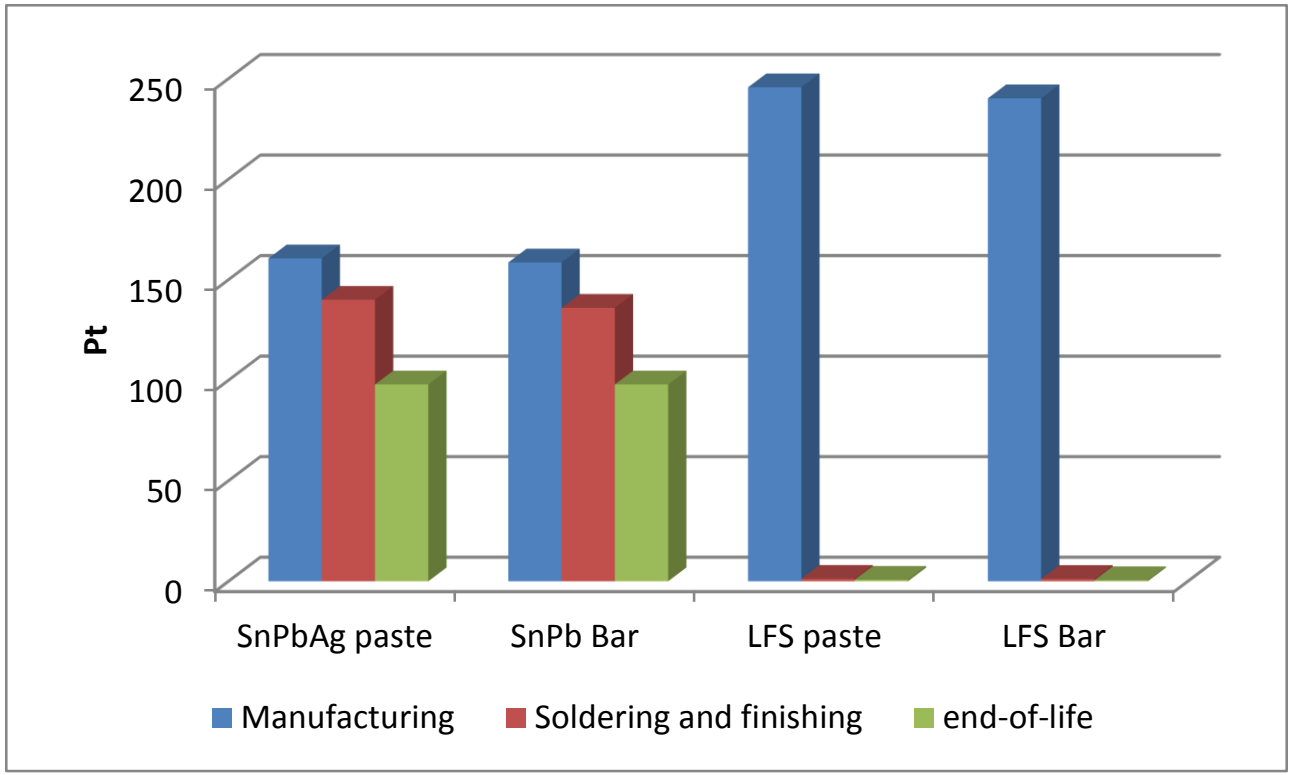
Comparison of Lead based and Lead Free solders Life Cycle



- Lead Free Solders (LFS) present lower environmental impacts than Lead based solders (≈38%)
- Resources damage category presents an increase of about 34%
- Human Health and Ecossytem quality have lower impacts

Results

Contribution of three major life cycle stages

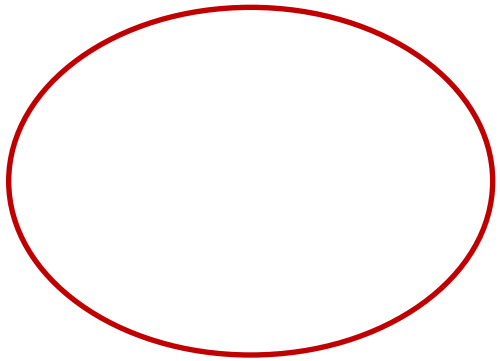


- 99,3% of LFS environmental impacts are due to solder manufacturing
- Environmental impacts descending distributed throughout its life cycle for of lead based solders
- Manufacture of Lead based solders present lower environmental impacts when compared to the LFS

Results

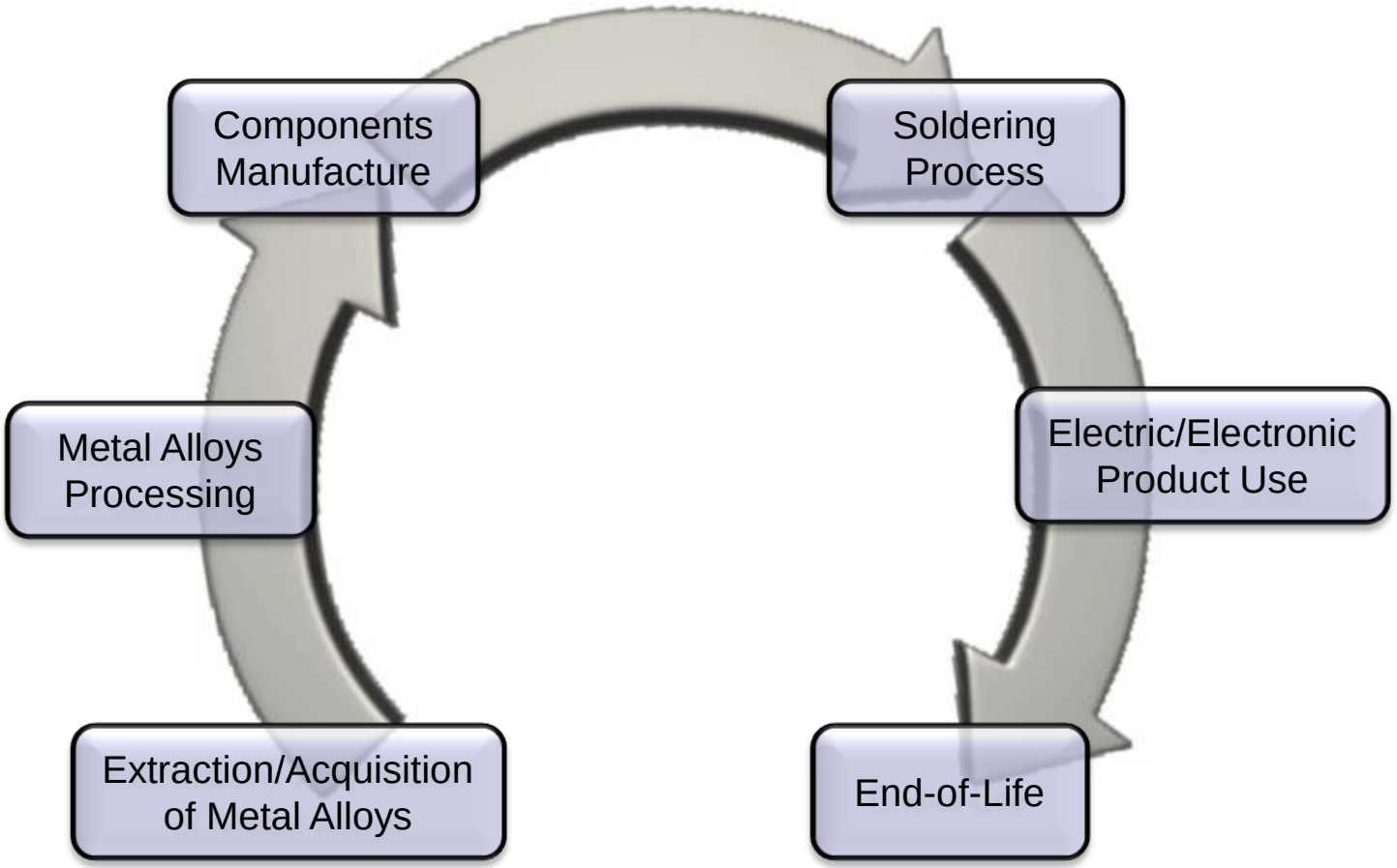
Contribution to the life cycle environmental impacts

	SnPb paste	SnPb Bar	LFS paste	LFS Bar
Manufacturing				
Soldering and finishing				
End-of-life				

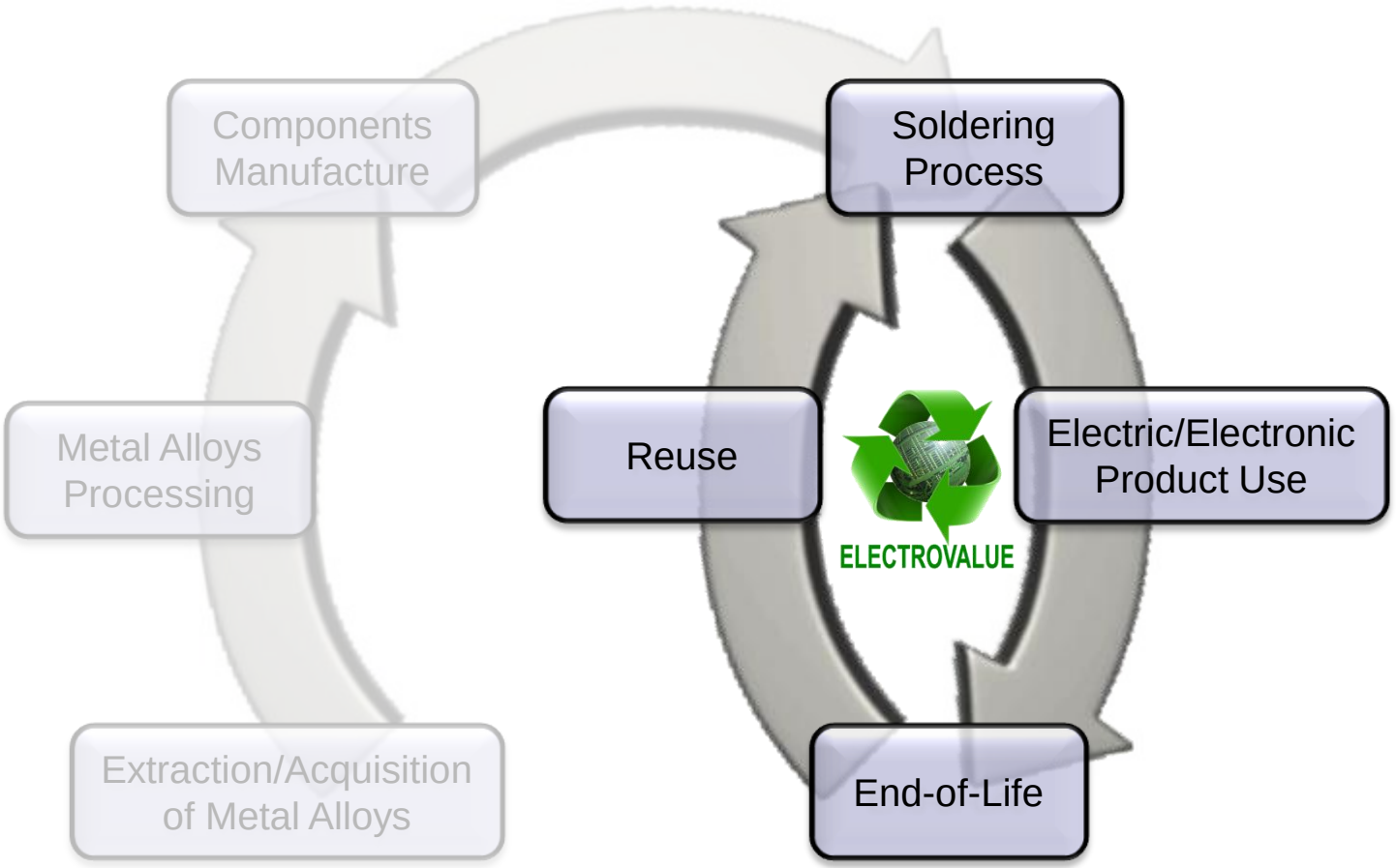


Significant reduction of exposure risk!

Components Life Cycle

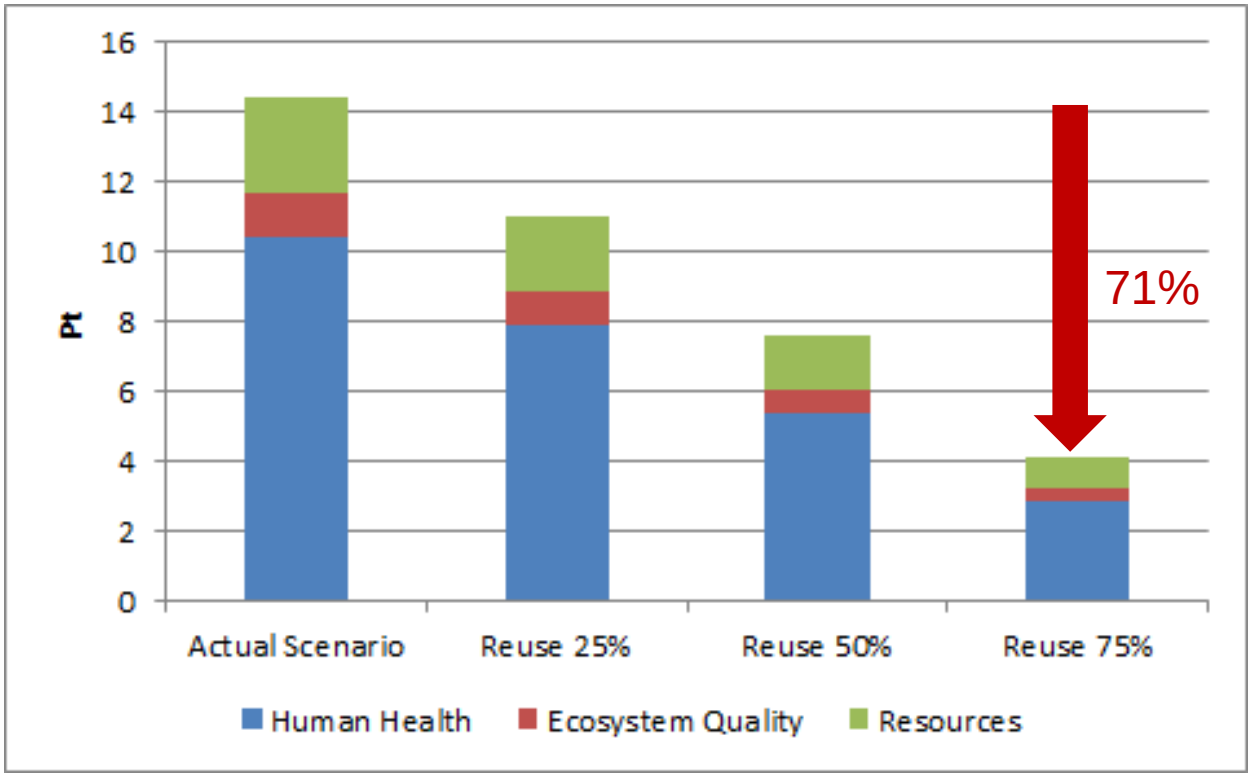


Components Life Cycle



Results

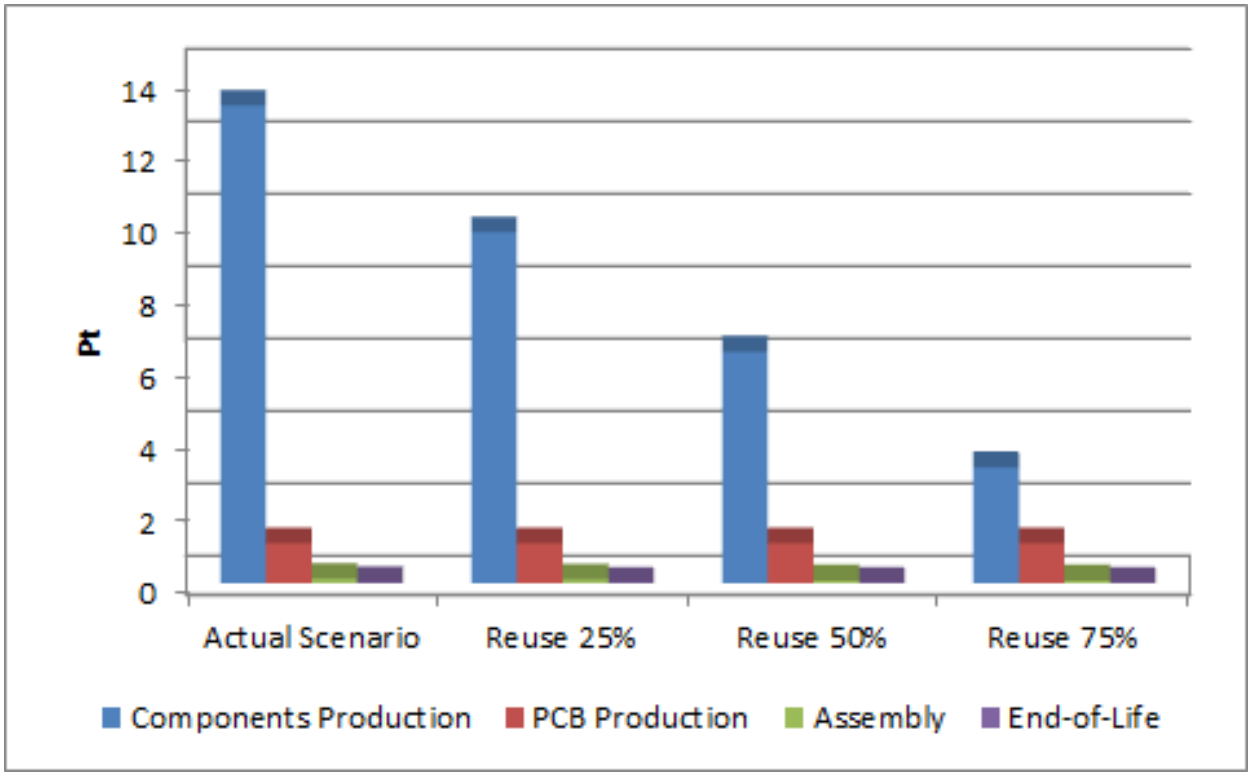
Comparison of different reuse percentages environmental impacts



- Different reuse percentages were given to the components in order to simulate the amount of components that confirm in compliance with the quality requirements.
- Human Health damage category still expresses considerable impact values

Results

Environmental impact contribution of the life cycle different stages



- Most of the environmental impacts (≈91%) occur during production of the EE components, which also includes the extraction of materials

Conclusions

- Lead-free solders present environmental benefits when compared to Lead based solders;
- The environmental benefits are mainly related to a decrease on Human Health impacts from a substantial reduction of exposure risk to Organic and Carcinogenic compounds during use and end-of-life stages;
- The most relevant environmental impact occur in the mineral extraction, exploitation and treatment of materials;
- The reuse of EE components has environmental benefits when compared to their recycling, mainly due to the avoidance of life cycle stages that present a high consumption of raw materials;

Other Results

ELECTROVALUE

Add Value to the Electronic Waste

Management Tool for SME, containing:

- International Legislation Database;
- Disassembly Training Courses;
- Guidelines for Technical Compliance;
- Environmental Analysis;
- Economical Analysis;
- Reliability;
- Safety Procedures;

http://www.electrovalueproject.eu/

C3P Center for Pollution Prevention Program

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Thank you for your attention!

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